Disjunctive Datalog: from Monadic to Guarded

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Some Equivalences

Motivation: strong equivalences between ontology-mediated queries, and disjunctive Datalog (and CSPs)

\[(\mathcal{ALC}, \text{CQ}) \equiv \text{monadic disjunctive Datalog (MDDLog)}\]
\[\cup \]
\[\text{frontier-guarded disjunctive Datalog (FGDDLog)}\]
\[= \text{coMMSNP2}\]

MDDLog fairly well understood:
- query containment decidable
- MDDL-rewritability decidable
- FO-rewritability decidable
- P/coNP dichotomy \(\equiv\) FV conjecture

[FederVardiSIAMJComp98, BourhisL__KR16, FeierKuusistoL__ICDT17]
FGDDLog: **for every head atom**, there is body atom that contains all its variables

GDDLog: there is body atom that contains all variables of the rule

For both languages, **all of the afore mentioned problems are open**

Query containment should be a **good starting point**—conceptually simple

Three approaches:

- Demonstrate witnesses of **simple structure** (for non-containment)
- Demonstrate **small** witnesses
- **Reduce** to CSP or to MDDLog